

What is claimed is:

- 5
1. A hybrid fiber/coax network, comprising:
a head end;
at least one optical distribution node coupled to the head end over at least one fiber optic link;
at least one coaxial cable link, coupled to the at least one optical distribution node, that receives upstream, digital data from a plurality of modems; and
wherein the at least one optical distribution node has a digital return path that
10 includes:
a laser transmitter coupled to the fiber optic link that transmits the upstream, digital data to the head end;
a data concentrator coupled to provide the upstream, digital data to the laser; and
15 for the at least one coaxial cable link,
a frequency translator that receives and translates the upstream, digital data from the plurality of modems to a different carrier frequency and retransmits the signal to the plurality of modems for collision detection; and
20 a data interface coupled between frequency translator and the data concentrator that determines whether the upstream, digital data is valid.
- 25
2. The network of claim 1, wherein at least a portion of the upstream, digital data is transmitted over the at least one coaxial cable link on modulated carriers below 42 MHZ.
- 30
3. The network of claim 1, wherein the modulated carriers are modulated with the upstream, digital data using one of on-off-keying, quadrature phase-shift keying and quadrature amplitude modulation.

55007-222240

4. The network of claim 1, wherein the upstream, digital data is carried on one of at least two modulated carriers.

5. The network of claim 1, wherein the plurality of modems transmit collision detection signals on a different modulated carrier when a collision is detected based on signals from the frequency translator.

6. The network of claim 1, wherein the upstream, digital data comprises Ethernet packets.

7. The network of claim 2, wherein at least another portion of the upstream, digital data is transmitted over the plurality of coaxial cable links on modulated carriers above a cut-off frequency for downstream transmissions.

8. The network of claim 1, wherein the laser transmitter transmits the upstream, digital data as one of base-band and modulated carrier transmission.

9. The network of claim 1, and further including a receiver circuit coupled to the fiber optic link and the at least one coaxial cable link that receives downstream optical signals and converts the signals to electrical signals for transmission over the at least one coaxial cable link.

10. A hybrid fiber-coax network, comprising:
a head end;
at least one optical distribution node coupled to the head end over at least one fiber optic link;
at least one coaxial cable link, coupled to the at least one optical distribution node, that receives upstream, digital data from a plurality of modems;

wherein at least a portion of the upstream, digital data is transmitted over the at least one coaxial cable link on at least one modulated carrier below a frequency range for downstream transmission; and

wherein the at least one optical distribution node includes circuitry for detecting
5 ~~collisions on the at least one coaxial cable link.~~

11. The network of claim 10, wherein the modulated carriers are modulated with the upstream, digital data using one of on-off-keying, quadrature phase-shift keying and quadrature amplitude modulation.

12. The network of claim 10, wherein the upstream, digital data is carried on one of at least two modulated carriers.

13. The network of claim 10, wherein the plurality of modems transmit collision
15 detection signals on a different modulated carrier when a collision is detected based on ~~signals from the frequency translator.~~

14. The network of claim 10, wherein the upstream, digital data comprises Ethernet
20 packets.

15. The network of claim 10, wherein at least another portion of the upstream, digital data is transmitted over the at least one coaxial cable link on modulated carriers above a cut-off frequency for the downstream transmissions.

16. The network of claim 10, wherein the at least one optical distribution node transmits the upstream, digital data as one of base-band and modulated carrier
25 transmission.

17. The network of claim 10, and further including a receiver circuit coupled to the
30 fiber optic link and the at least one coaxial cable link that receives downstream optical

signals and converts the signals to electrical signals for transmission over the at least one coaxial cable link.

53
B2
5

18. An optical distribution node for an hybrid fiber/coax network, the optical distribution node comprising:
a laser transmitter coupleable to a fiber optic link that transmits upstream, digital data to a head end of the network;
a data concentrator coupled to provide the upstream, digital data to the laser; and
for at least one coaxial cable link of the network coupleable to the optical
10 distribution node,
a frequency translator that receives the upstream, digital data modulated
on a first carrier frequency from a plurality of modems and
translates the upstream, digital data to a different carrier and
retransmits the upstream, digital data to the plurality of modems
15 for collision detection; and
a data interface coupled between the at least one coaxial cable link and
the data concentrator that determines whether the upstream data
is valid.

66007-2222460

20 19. The node of claim 18, and further including at least one media access unit coupled to the at least one coaxial cable link and the data concentrator.

20. The node of claim 18, wherein the upstream, digital data comprises Ethernet packets.

25 21. The node of claim 18, wherein the laser transmitter transmits the upstream, digital data as one of base-band and modulated carrier transmission.

Sub
C1

22. The node of claim 18, wherein the frequency translator also receives upstream,
30 digital data on at least one additional carrier.

23. The node of claim 18, wherein the frequency translator receives the upstream, digital data modulated on a first carrier with a frequency that is below the frequency range for downstream transmissions.

5 24. A method for processing data in a return path of a hybrid fiber/coax network, the method comprising:

receiving, on a first coaxial cable, upstream, digital data modulated on a first carrier;

translating the frequency of the first carrier to a second frequency;

10 retransmitting the upstream, digital data modulated on the carrier with the second frequency;

checking for collision detection signals based on the retransmitted upstream, digital data;

15 concentrating the upstream, digital data with upstream, digital data from other coaxial cables; and

transmitting the concentrated, upstream, digital data to the head end.

20 25. The method of claim 24, wherein receiving digital data comprises receiving digital data on a first carrier below a frequency range for downstream transmission.

26. The method of claim 24, wherein translating the frequency of the first carrier comprises translating the frequency of the first carrier to a second frequency below the frequency used for downstream transmission.

25 27. The method of claim 24, wherein checking for collision detection signals comprises monitoring a third frequency for collision detection signals.

28. The method of claim 24, wherein transmitting the concentrated, upstream, digital data comprises transmitting base-band signals as one of base-band and
30 modulated carrier transmission.

29. The method of claim 24, wherein receiving, on a coaxial cable, upstream, digital data comprises receiving Ethernet packets on a modulated carrier.

SECRET - CONFIDENTIAL